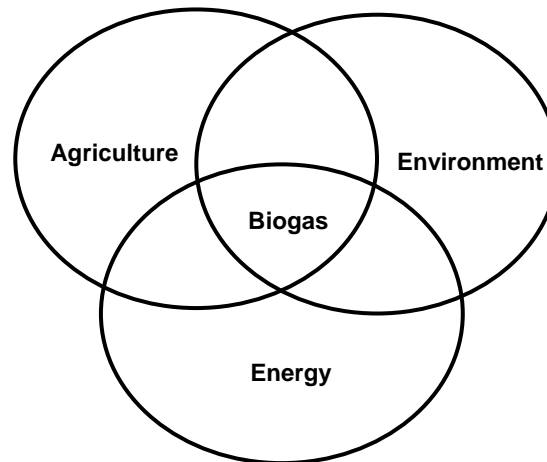


## **Per Thostrup – 30 years in Biogas – Ms. Ag. Engineer**

- 1978 – 82 Research and technical development (RTD)
- 1982 – 92 Planning of Biogas Plants and RTD
- 1992 – 97 Design of Biogas plants (and RTD)
- 1997 – 02 Build of Biogas Plants
- 2002 – 09 Operation of Biogas plants
- Present: CEO of [www.NordicBioEnergy.dk](http://www.NordicBioEnergy.dk)

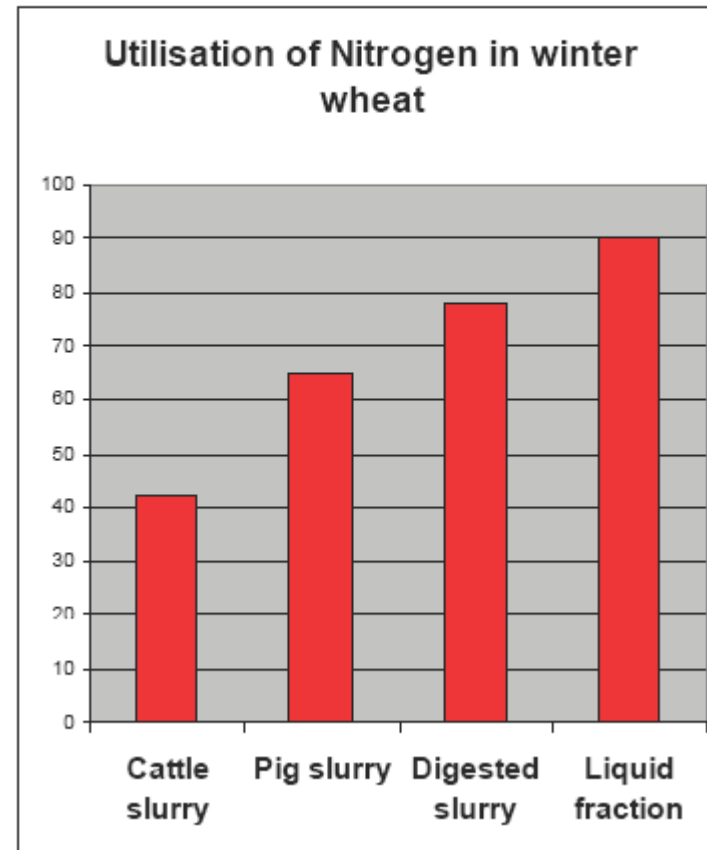


# Centralized Biogas Plants play a major role in going more sustainable



## Advantages of biogas plants

- Greenhouse gas reduction
- Utilisation of organic waste
- Redistribution of manure
- Organic fertiliser
- Smell from slurry reduced
- Improved nitrogen utilisation
- Reduced risk of leaching
- Separation of digested biomass
  - low technology
  - net energy surplus

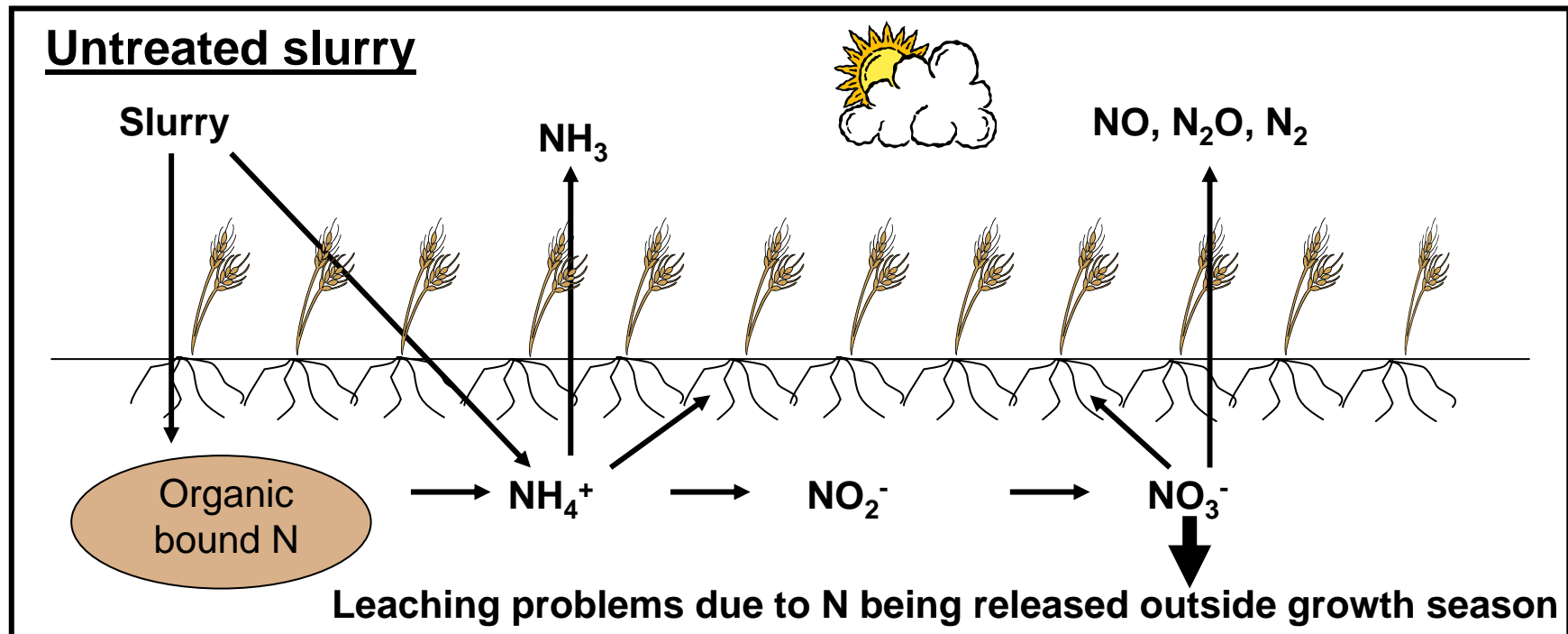


# Utilisation of slurry

**N: 55+10%**

**P: 80%**

**K: 80%**

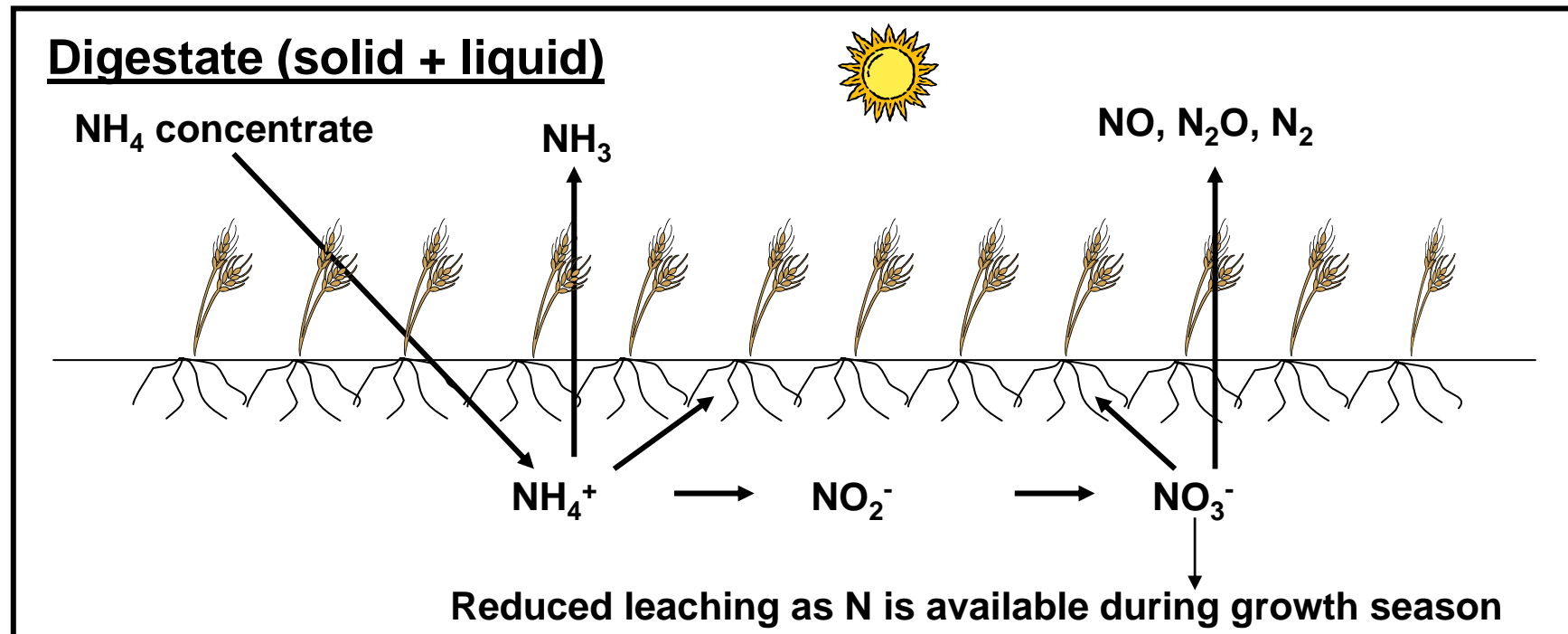


# Utilisation of organic fertiliser fractions

**N: 65%⇒95%**

**P: 80%⇒95%**

**K: 80%⇒95%**







Broadspreading of slurry is not allowed any more in Denmark due to resulting high ammonia evaporation





Agricultural biogas plants fit well with the general transition into efficient use of liquid manure (slurry) as a fertilizer



Application of slurry in winter wheat with trailing hoses

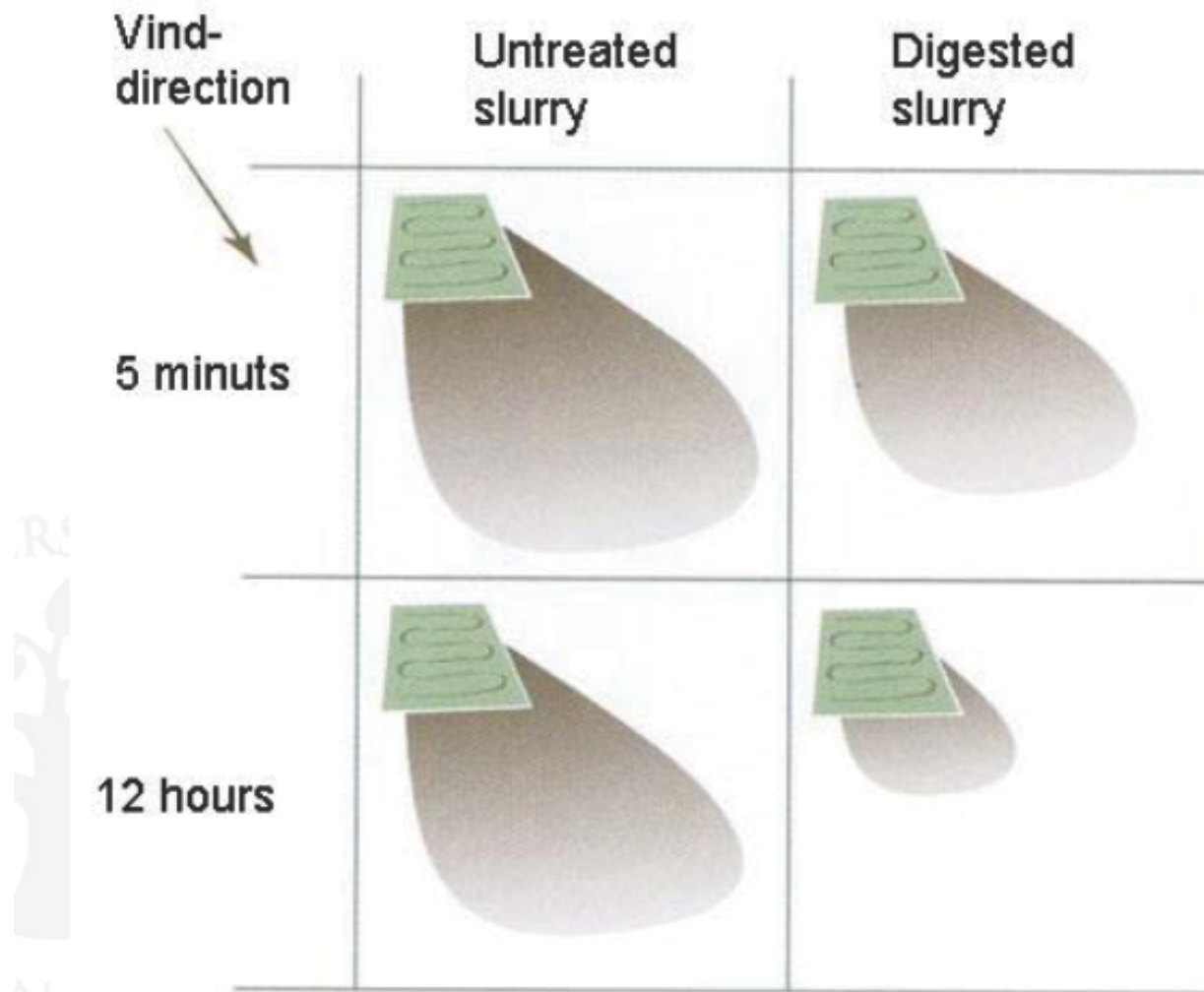


Injection of slurry in bare soil





## Odour reduction by application of digestate

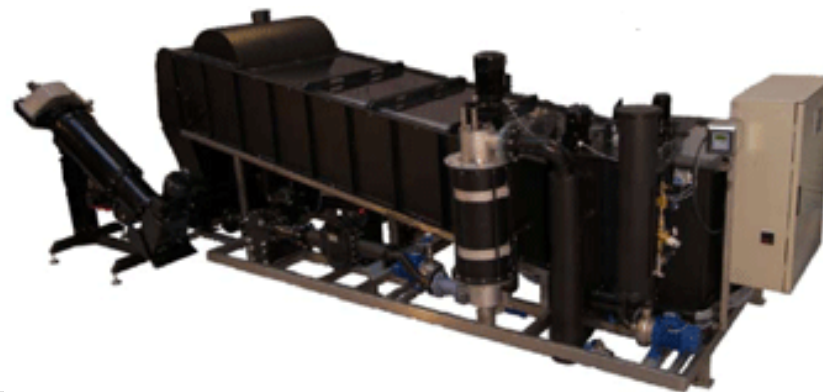




# Separation technologies

Mechanical  
separation  
Bimatech from  
Samson

Chemical  
separation from  
Kemira



Digested biomass	kg	kg/t
Quantity	1,000	–
Dry matter, 2,8%	28	28
Water	972	972
Total-N	5	5
NH <sub>4</sub> -N	4	4
Phosphorus, P	0.9	0.9
Potassium, K	2.8	2.8

Separation

Fibre fraction	kg	kg/t
Quantity	80	–
Dry matter, 30%	24	300
Water	56	700
Total-N	1.25	15.6
NH <sub>4</sub> -N	0.3	3.8
Phosphorus, P	0.7	8.8
Potassium, K	0.2	2.5

Liquid fraction	kg	kg/t
Quantity	920	–
Dry matter, 0,4%	4	4.3
Water	916	995
Total-N	3.75	4.1
NH <sub>4</sub> -N	3.7	4.0
Phosphorus, P	0.2	0.2
Potassium, K	2.6	2.8



# N-application in Denmark

